

# INVESTIGATION OF THE INTERACTION MECHANISMS IN THE REACTIONS WITH HEAVY IONS

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The reaction mechanisms have already been studied during last several decades in many reactions with heavy ions. Several processes can take place at the interaction of two colliding nuclei. The main of them are fusion-fission, quasifission, fast fission, the formation of the evaporation residue, deep inelastic collisions and, finally, quasielastic and elastic scattering.

A big set of the experimental data obtained in very different nuclear reactions were measured with use of double-arm Time-Of-Flight spectrometer of the reaction products –CORSET [1]. The experiments were carried out in FLNR JINR at U-400 and U-400M accelerators, and in other European and American scientific centers as well. The investigated compound nuclei last from neutron-deficient  $^{178}\text{Pt}$  up to superheavy nucleus with  $Z=122$ . In some case it is possible to distinguish different mechanisms and extract their corresponding mass-energy distributions. Moreover, the applied experimental methods give the possibility to deduce the cross-section values of different processes. The detailed analysis of mass-energy distributions of the reaction products indicates that not only spherical proton and neutron shells influence on the behavior of mass and energy distributions, but deformed proton shells either.

The upgraded spectrometer CORSET consists of four arms which allow measure not only time of flight of the reaction products, but also their kinetic energy (ToF-E method). Such configuration of the arms gives the possibility to register not only binary products of the multi-nucleon transfer reactions, but also the products of the sequential fission of heavy fragment, which is very excited and also can fission. The study of the reaction  $^{209}\text{Bi}+^{238}\text{U}$  showed that due to this promising method it is possible to form superheavy nuclei with charge number up to  $Z=110$ . This type of the reactions can give the possibility to obtain and investigate neutron-rich superheavy nuclei, which are impossible to be synthesized in other ways due to limited varies of beam-target ion combinations.

Possible ways of the set-up development also will be discussed in the presentation. The proposed upgrade of the spectrometer would significantly enlarge the facilities for experimental investigations of reaction mechanisms observed in reactions with different entrance channel properties, and allow investigations of the structure both reaction products and evaporation residues.

## Section

Nuclear physics (Section 1)

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